Assessment of background quality of groundwater in agro-livestock farming areas of South Korea

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Background levels of anthropogenic components such as nitrate should be accurately determined to assess the pollution status of groundwater. For this purpose, threshold value is used to discriminate between natural background group and polluted group. Kim et al. (2015) [1] evaluated the thresholds of nitrate in South Korean groundwater as 3.0 and 5.5 mg/L NO_3 respectively for bedrock groundwater and alluvial groundwater, based on data from Korean Groundwater Monitoring Network. The present study is aimed to re-evaluate the thresholds by using the model-based cluster analysis of hydrochemical data for groundwater samples (n=4000) from 100 agro-livestock farming areas in South Korea. Data of total organic carbon, coliform bacillus, and calculated nitrate loading for each study area were also used to test the reliability of evaluation as those variables can be additional indicators of anthropogenic contamination. The results show that for the areas where the average nitrate concentration of sampled groundwater exceeds the suggested threshold value, there is a clear positive correlation between the site-specific, nitrate loading and average nitrate level. Based on the examination of the statistical distribution of nitrate data for such anthropogenic samples, 15.0 mg/L NO_3 are proposed as the threshold value which can be used to discriminate the local contamination impact of livestock farming from widespread and historic, regional contamination in agro-livestock farming areas of South Korea.

[1] K.H. Kim, S.T. Yun, H.K. Kim, J.W. Kim, 2015, Determination of natural backgrounds and thresholds of nitrate in South Korean groundwater using model-based statistical approaches. *J. Geochem. Explor.* **148**, p. 196-205.